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(54) **Tread.**

(57) A tire 5 having a plurality of tread layers 10, 12, 14 wherein the outer layers have good cut, wear and tear resistance and the inner layers have good heat resistance. The tire includes a carcass 16 having a crown portion 20, belts 26, sidewalls 18 and circumferential beads 22. A shoulder portion 28 is the area most sensitive to heat buildup.

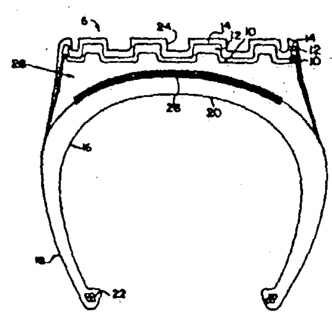

FIG.1

EP 0 105 822 A2

Croydon Printing Company Ltd.

TITLE MODIFIED
see front page

RAINBOW TREAD

TECHNICAL FIELD

This invention relates to tires and, more particularly to a tire having a tread composed of a plurality of layers, each layer having different physical properties.

BACKGROUND ART

The conventional method of constructing tires consists of applying and vulcanizing a tread of uniform composition to a tire carcass. Physical properties of the tread compound are dictated by, among other things, the tire load anticipated and the roughness of the terrain in which the tire is ued. In many instances, two or more requirements of a tread compound may be inconsistent with each other and thus the tread compound must be a compromise between the competing requirements.

The shortcomings of prior art tread compositions are especially noticeable in large tires wherein, due to the thickness of the tire, heat tends to build up and is not dissipated from the central portionof the tire, that is the bottom portion of the tread area as well as the belt area. Additionally, the outer tread surface of such a tire in many instances is subjected to abrasion and cutting actions as when utilized in mining operations and the like.

DISCLOSURE OF INVENTION

It is therefore an aspect of the present invention to provide a tire having inner tread layers f improved heat resistance and outer layers of improved tear resistance.

Another aspect of the invention is to provide a tire having a tread composed of two or more layers, each layer of a different composition, and having a different degree of heat and cut and tear resistance properties.

Another aspect of the present invention is to provide an earth moving tire having a plurality of tread layers, as above, which can be applied by a laminating process.

Still another aspect of the present invention is to provide a tire having a plurality of tread layers, as above, wherein the number of layers ranges from two to ten.

These aspects and others which will become apparent as the detailed description proceeds, are achieved by: a tire, comprising: a carcass; a tread adhered to said carcass; said tread having at least an inner layer having good heat resistant properties; said tread having at least an outer layer having good wear, cut and tear resistant properties; and wherein said tread has from 3 to 10 layers.

In general, a process for making a tire having at least an inner tread layer composition and at least an outer tread layer composition, comprising the steps of: compounding said layer compositions; calendering said layers to a sheet; wrapping said layers on a tire carcass; wherein said inner layer has good heat resistant properties and said outer layer has good wear, cut and tear resistant properties.

BRIEF DESCRIPTION OF DRAWINGS

For a complete understanding of the objects, techniques, and structure of the invention, reference should be had to the following detailed description and accompanying drawings wherein:

Fig. 1 is a cross-sectional view of a tire

having a three layer tread; and

Fig. 2 is a partial cross-sectional view of a tire having a six layer tread.

BEST MODE FOR CARRYING OUT THE INVENTION

According to the present invention, a tread is provided which has a plurality of layers with the different layers having different physical properties. In general, the outer tread layers will have high abrasion resistance, cutting resistance and the like including good wear rates whereas the inner layers will have good heat resistance.

Referring to Fig. 1, a cross-section of a tire having three tread layers is designated by the number 5. Tread layers 10, 12 and 14 are positioned radially outward from a crown portion 20 of a tire carcass 16. Belts 26 may be interposed between layer 10 and crown 20 by suitable means. Carcass 16 also contains sidewalls 18 and circumferential beads 22 of rigid material on either side.

Non-skid tread layer 14 contains tread grooves 24. It can be seen that the tread layers follow tread grooves 24 such that layers 10 and 12 are thinner at the groove locations. Thus, when layer 14 has been worn away, the tire 5 may still contain some tread groove and thus still be serviceable.

Layer 14 has extremely good tear and wear resistance properties and relatively poor heat resistance properties. Because a lesser amount of heat is built up on the outer surface of the tread, the lack of heat resistance properties is not detrimental to tire life or to tread 14.

On the other hand, a great deal of heat build-up occurs in the shoulder areas 28 and, to a lesser extent in the area immediately above the crown 20 of the carcass 16. It is in the shoulder area 28

where a great deal of flexing occurs. Heat is generated by hysteretic action and is dissipated very slowly due to the low surface to volume ratio in the shoulder area. Because layer 10 is not in contact with the ground, there is no need to have a high degree of tear, cut and/or wear resistance in this layer, and thus this layer can be optimized for heat resistance. Between layers 10 and 14, layer 12 may be compounded to contain an intermediate amount of heat resistance and tear resistance as it is eventually exposed somewhat to the ground and thus to abrasive rock and particles which may cause tearing. Layer 12 must also resist heat build-up, although to a lesser extent than layer 10.

In Fig. 2, a cross-section of a portion of a six layer tread is designated by the number 30. Layer 34, having good heat resistance properties, is positioned immediately above carcass 32. Above layer 34 are placed sequentially layers 36, 38, 40 and 42 having progressively less heat resistance and progressively more wear, cut and tear resistance. Layer 44 has the greatest amount of wear, cut and tear resistance and relatively poor heat resistance.

As in the three layered embodiment of Fig. 1, a tread groove 46 has several tread layers compressed beneath it.At shoulder area 48, the greatest amount of heat build-up occurs due to flexing of the tread during normal use. Thus, this area has high heat resistance. Heat resistance is measured by rebound, which is an indication of expected heat dissipation efficiency.

There are numerous, well-known and conventional tread compounds yielding good wear, tear and cut resistance which can be utilized in the present inv ntion. Similarly, the same holds true for a tread layer having good heat resistance.

Examples of ingredients which give good

wear, tear and cut resistance in a tread compound include natural rubber (cis-1,4-polyisoprene), hydrated amorphous silica and equivalents thereof, carbon blacks having either high, intermediate, or low surface areas, common or conventional synthetic rubbers such as styrene-butadiene rubber, synthetic cis-1,4-polyisoprene, and medium vinyl polybutadiene, that is, polybutadiene having a vinyl content of between 30 and 50%. In other words, rubber made from dienes having from 4 to 10 carbon atoms, copolymers made from dienes having from 4 to 10 carbon atoms with vinyl substituted aromatics having from 8 to 12 carbon atoms (e.g., styrene-butadiene rubber), nitrile rubber, and the like. Examples of suitable synthetic rubbers are set forth in The Vanderbilt Rubber Handbook, Winspear, R.T. Vanderbilt Co., 1968, which is hereby fully incorporated by reference. Tread compounds can also be formulated having incorporated therein shredded wire to increase cut resistance.

Tread compounds having good heat resistance generally have a large amount of natural rubber (cis-1,4-polyisoprene) such as Hevea or Guayule, low surface area carbon black, little or no synthetic rubber and little or no amounts of silica or other non-carbon black fillers.

For a three layer tread as in Fig. 1, the wear, cut and tear resistant layer 15 contains between about 0 or 0.1 and 30 PHR of natural cis-1,4-polyisoprene with about between 0 and 10 being preferred; between about 70 and 100 PHR of styrene-butadiene rubber with between about 90 and 100 being preferred; between about 40 and 80 PHR of a high surface area carbon black with between about 55 and 65 PHR being preferred; between about 0 and 30 PHR of a hydrated amorphous silica with about 10 and 20 being preferred. Exemplary of carbon blacks having high surface area and suitable for use in layer 14 are those with th

following ASTM designations: N-121, N-219, N-220, N-231, N-234 and N-242. These blacks are the ones commonly used in tire construction, but is is to be understood that there are other blacks available which are equally suitable but are not normally used in tire compounds because of availability or cost. Furthermore, it is to be understood that whenever a high, intermediate or low surface area carbon black is utilized, either or both of the remaining types of carbon black can be utilized in amounts such that they produce the same type of result as the specified carbon black. In addition, tread layer 14 may have incorporated therein shredded wire of between about 0, or 0.1 and about 20 PHR, said wire having a diameter of between about 0.004 to about 0.008 inches with a length varying between 1/4 and 1/2 inches. The shredded wire is generally steel and optionally may have a brass or copper coating.

Layer 10 having good heat resistance properties can contain about between 70 and 100 PHR of natural cis-1,4-polyisoprene with about between 95 and 100 being preferred; between about 30 and 0 PHR of styrene-butadiene rubber with between about 10 and 0 PHR being preferred; between about 10 and 50 PHR of a carbon black having a low surface area with between about 30 and 40 PHR being preferred; and between about 0 and 15 PHR of a hydrated amorphous silica with between about 5 and 0 being preferred. Carbon blacks having low surface area include those with ASTM designations N-650 and N-660. As previously noted, intermediate or high surface area carbon blacks can also be used in lieu of the low surface area carbon black but is not preferred.

Layer 12, disposed between layers 10 and 14, has intermediate properties, as stated above. A typical formulation for layer 12 includes between about 30 and 75 PHR of natural cis-1,4-polyisoprene, with

between about 50 and 70 being preferred; between about 70 and 25 PHR of styrene-butadiene rubber, with about between 40 and 30 being preferred; between about 25 and 65 PHR of a carbon black having an intermediate surface area with about between 35 and 55 PHR being preferred; and between about 0 and 20 PHR of a hydrated amorphous silica with about between 0 and 10 PHR being preferred. Carbon blacks having intermediate surface area and thus suitable for layer 12 include those with ASTM designations N-326, N-327, N-330, N-339 and N-347.

Each of the three layers 10, 12 and 14 also contain various well known antioxidants, processing oil, curatives, antiozonates, and other conventional additives in amounts which are conventional in the art. Specific examples of these ingredients may be found in The Vanderbilt Rubber Handbook, Winspear, Geo. editor, R.T. Vanderbilt Co., Inc., 1968.

For the six layer tread of Fig. 2, outer, non-skid layer 44 might have the same tread recipe as layer 14 of Fig. 1, thus also high in wear, cut and tear resistance and relatively poor in heat resistance. Further, layer 34 having good heat resistance might have a compounding recipe similar to layer 10 of the tire in Fig. 1. Middle layers 36, 38, 40 and 42 contain tread compounds which have properties intermediate between the innermost and outermost layers 32 and 44 respectively. Generally, the tire compounder has greater flexibility as the number of tread layers is increased. The tread compounds can become more specialized and thus have a narrower range of amounts of ingredients. Thus for example, the outer non-skid layer 44 of the six layer tread might have narrower ranges than the outer layer of the three layer tread. Specifically, the amount of natural rubber or cis-1,4-polyisoprene is present in the outer layer in the range of between ab ut 0 and 5 PHR with about betwe n 0 and 3 PHR being preferred. Styrene-butadien may range in

the amount between about 100 and 95 PHR with between about 100 and 97 being preferred. Carbon black having a high surface area is present in amounts between about 50 and 80 PHR with between about 55 and 65 PHR being preferred. Hydrated amorphous silica is present in amounts between about 0 and 30 PHR with between about 10 and 20 PHR being preferred. Carbon blacks having high surface area and thus suitable for incorporation in the outer layer 44 include those listed above, vis., ASTM designations N-121, N-219, N-220, N-231, N-234 and N-242.

The innermost, heat resistant layer 34 contains between about 95 and 100 PHR of natural cis-1,4-polyisoprene with between about 98 and 100 PHR being preferred; between about 5 and 0 PHR of styrene-butadiene rubber with between about 3 and 9 PHR being preferred; between about 20 and 40 PHR of a low surface area carbon black with between about 25 and 35 PHR being preferred; and between about 0 and 15 PHR of a hydrated amorphous silica with between about 0 and 5 PHR being preferred. Suitable low surface area carbon blacks include ASTM designations N-650 and N-660.

Layer 36 has between about 80 and 95 PHR of a natural cis-1,4-polyisoprene with about between 88 and 92 PHR being preferred; between about 20 and 5 PHR of styrene-butadiene rubber with about between 15 and 8 PHR being preferred; between about 25 and 45 PHR of a low surface area carbon black with about between 37 and 43 PHR being preferred; and about between 0 and 15 PHR of a hydrated amorphous silica with about between 3 and 7 PHR being preferred.

Layer 38 contains about between 60 and 80 PHR of a natural cis-1,4-polyisoprene with about between 73 and 78 PHR being preferred; about between 40 and 20 PHR of styrene-butadiene rubber with about between 30 and 27 PHR being preferred; between about 30 and 50 PHR of an intermediate surface area carbon black with about

between 35 and 45 PHR being preferred; between about 0 and 20 PHR of a hydrated amorphous silica with about 3 and 8 PHR being preferred.

Layer 40 would contain about between 40 and 60 PHR of a natural cis-1,4-polyisoprene with about between 48 and 53 PHR being preferred; about between 60 and 40 PHR of styrene-butadiene rubber with about between 48 and 53 PHR being preferred, about between 35 and 55 PHR of an intermediate surface area carbon black with about between 43 and 48 PHR being preferred and about between 0 and 20 PHR of a hydrated amorphous silica with about between 7 and 13 PHR being preferred. The intermediate surface area carbon blacks of layers 38 and 40 include those having ASTM designations N-326, N-327, N-330, N-339 and N-347.

Finally, layer 42 positioned just beneath layer 44 would have about between 5 and 40 PHR of a natural cis-1,4-polyisoprene with about between 7 and 13 PHR being preferred; about between 95 and 60 PHR of styrene-butadiene rubber with about between 93 and 87 PHR being preferred, about between 45 and 65 PHR of a high surface area carbon black with about between 48 and 53 PHR being preferred; about between 0 and 30 PHR of a hydrated amorphous silica with about between 13 and 18 PHR being preferred.

As in the three layer tread 5 of Fig. 1, the six layer tread 30 contains conventional amounts of antioxidants, processing oil and curatives as well as other additives well known to the art. In addition, any of layers 34 through 44 may contain shredded wire of between 0 and 20 PHR having dimensions similar to those described hereinabove.

While the foregoing describes compositions of the various tread layers of the invention, it will be appreciated that such disclosure is given to enable those skilled in the art to make tread layers merely representative of those having the desired physical

properties. Other compound recipies may be used to make tread layers having the same physical properties. Accordingly, reference should be made to Table II and Table III which summarize the physical properties of a three layered and a six layered tread respectively.

A conventional laminating process used for manufacturing earth moving tires and other large tires lends itself nicely to the use of a plurality of tread layers as described herein. In the laminating process the rubber compound is broken down either on a mill or on a cold feed extruder, then calendered to a sheet and wrapped on the tire carcass to the dsired thickness and profile. The wrapping is carried out at between about 150° to about 190°F. The laminating process can also be adapted to smaller tires such as tractor tires, passenger tires and the like. Rubber compounds are fed to the extruder in the order in which they are applied to the tire carcass. Thus, for a six layered tread, the compound of layer 34 is first fed to the extruder, followed by layers 36, 38, 40, 42 and 44. Some blending occurs where the heels of the adjacent compounds mix in the extruder.

The invention will be better understood by reference to the following example. The following example illustrates the preferred embodiment in which a six layered tread is applied to an earth moving tire.

EXAMPLE I

The compounds set forth in Table I were charged to an extruder feeding a laminating machine. Compound F was charged first followed sequentially by compounds E, D, C, B, and A. These combinations of rubbers, carbon blacks, etc., are combined with conventional compounding ingredients including sulfur, zinc oxide, stearic acid, and the like. The laminator

calendered the rubber giving a layer of rubber .080-.090 inches thick which was continuously wrapped on the tire carcass mounted on a conventional drum. Each layer was 1/2 to 1-1/2 inches thickn. The tire was then cured in a conventional manner.

TABLE I

	Outer Layer High Wear, Tear & Cut Resistance					Inner Layer Best Heat Resistance
	A	B	C	D	E	F
Natural Rubber	0	10	50	75	90	100
SBR	100	90	50	25	10	0
Carbon Black						
Iodine #115(a)	60	59				
Iodine # 85(b)	-		45	40		
Iodine # 35(c)					40	30
Hydrated Amorphous Silica (o)	15	15	10	5	5	0
Antioxidant (1)	2	2	2	2	2	2
Processing Oil (2)	25	25	10	10	10	10
Accelerator (3)	2	2	2	2	2	2
300% Modulus	9.1	9.8	10.4	11.4	11.4	11.6
Tensile (4)	17.7	18.4	19.2	20.0	22.2	24.0
Elongation (%)	500	510	525	550	555	555
Tear N/IN	1290	1280	1260	1249	940	890
Rebound (%)(5)	69	71	73	75	80	89
Pico Abrasion (6)	103	98	96	94	82	80

(a) High surface area.

(b) Intermediate surface area.

(c) Low surface area.

(o) Hi-Sil 215 manufactured by Pittsburgh Plate Glass

(1) Diamine type.

(2) Aromatic type.

(3) Morpholine disulfide type.

(4) Meganewtons per square meter.

(5) Measured by ASTM 1054.

(6) Measured by ASTM D 2228.

TABLE II

PHYSICAL PROPERTIES
THREE LAYER TREAD

Tread Layer	Range	Tear[1]	Rebound[2]	Pica Abrasion[3]
	General	830-1050	82-96	70-90
Inner	Desired	850-930	85-93	75-85
	Preferred	870-910	87-91	78-82
	General	1050-1290	69-82	84-104
Middle	Desired	1210-1270	71-79	89-99
	Preferred	1230-1250	73-77	92-96
	General	1230-1350	64-74	96-110
Outer	Desired	1250-1330	66-72	98-108
	Preferred	1270-1310	68-70	101-105

1. Measured in Newtons/Inch on Instron
2. ASTM D1054 (%)
3. ASTM D2228 Units.

TABLE III

PHYSICAL PROPERTIES
SIX LAYER TREAD

TREAD LAYER	RANGE	TEAR[1]	REBOUND[2]	PICO ABRASION[3]
	General	830-1060	82-96	70-90
Inner	Desired	850-930	85-93	75-85
	Preferred	870-910	87-91	78-82
	General	1060-1200	75-85	74-94
2nd Inner	Desired	1200-1280	77-83	77-87
	Preferred	1220-1260	79-81	80-84
	General	1190-1290	69-81	84-104
3rd Inner	Desired	1210-1270	71-79	89-99
	Preferred	1230-1250	73-77	92-96
	General	1200-1330	67-79	88-108
4th Inner	Desired	1230-1300	69-77	91-101
	Preferred	1250-1270	71-75	94-98
	General	1230-1330	65-76	92-110
5th Inner	Desired	1250-1310	67-74	94-102
	Preferred	1270-1290	69-72	96-100
	General	1230-1350	64-74	96-112
6th Inner	Desired	1250-1330	66-72	98-108
	Preferred	1270-1310	68-70	101-105

1. Measured in Newtons/Inch on Instron
2. ASTM D1054 (%)
3. ASTM D2228 Units

In g neral, the number of tread layers can vary from 2 to about 10, more commonly from 3 and 7 layers, and preferably from 3 to 6. Tread layer thickness depends to a large extent on the type of tire being manufactured and the number of layers desired. Generally the thickness may vary between about 1/4 and 6 inches, desirably between 1 inch and 4 inches. For earth moving tires, about 1-1/2 inches per tread layer is preferred.

While in accordance with the Patent Statutes, the best mode and preferred embodiments have been set forth, it will be apparent to those skilled in the art that various changes and modifications can be made without departing from the spirit or scope of the invention. Accordingly, the invention is measured by the scope of the attached claims.

WHAT IS CLAIMED IS:

1. A tire, characterizing:
a carcass;
a tread adhered to said carcass;
said tread having at least an inner layer having good heat resistant properties;
said tread having at least an outer layer having good wear, cut and tear resistant properties;

wherein said tread has from 3 to 10 layers, each of said tread layers containing one or more ingredients selected from the group consisting of natural cis 1,4 polyisoprene, carbon black, synthetic rubber, and hydrated amorphous silica; and
wherein said tread layers are between 1/4 inch and 6 inches in thickness.

2. A tire according to Claim 1, wherein said tread has three layers, characterizing:
said inner layer having a tear value of from about 830 to 1050 Newtons per inch, a rebound value of between about 82% and 96% and a Pico abrasion value of from about 70 and 90;
a middle layer having a tear value of between about 1050 and 1290 Newtons per inch, a rebound value of from about 69% and 82%, and a Pico abrasion value of between about 84 and 104; and
said outer layer having a tear value of between about 1230 and 1350 Newtons per inch, a rebound value of from about 64% and 74%, and a Pico abrasion value of from about 96 and 100..

3. A tire according to Claim 1, wherein said tread has six layers, comprising:
said inner layer having a tear value of

between about 830 and 1060 Newtons per inch, a rebound value of from about 82 and 96, and a Pico abrasion value of from about 70 and 90;

a second innermost layer having a tear value of from about 1060 and 1200 Newtons per inch, a rebound value of from about 75 and 85, and a Pico abrasion value of from about 74 and 94;

a third innermost layer having a tear value of from about 1190 and 1290 Newtons per inch, a rebound value of from about 69 and 81 and a Pico abrasion value of from about 84 and 104;

a fourth innermost layer having a tear value of from about 1200 and 1330 Newtons per inch, a rebound value of from about 67 and 79, and a Pico abrasion value of from about 88 and 108;

a fifth innermost layer having a tear value of from about 1230 and 1330 Newtons per inch, a rebound value of from about 65 and 76, and a Pico abrasion value of from about 92 and 100; and

said outer layer having a tear value of from about 1230 and 1350 Newtons per inch, a rebound value of from about 64 and 74, and a Pico abrasion value of from about 96 and 112.

4. A tire according to Claim 1, wherein said tire has 3 layers and said inner layer has between about 70 and 100 PHR of a natural cis 1,4 polyisoprene; about between 30 and 0 PHR of synthetic rubber; between about 10 and 50 PHR of a low surface area carbon black; and between about 0 and 15 PHR of a hydrated amorphous silica;

said outer layer has about between 0 and 30 PHR of a natural cis 1,4 polyisoprene; about between 70 and 100 PHR of synthetic rubber; about between 40 and 80 PHR of a high surface area carbon black; and about between 0 and 30 PHR of a hydrated amorphous

silica; and

wherein said tire has an intermediate layer having between about 30 and 75 PHR of a natural cis 1,4 polyisoprene; about between 70 and 25 PHR of synthetic rubber; about between 25 and 65 PHR of an intermediate surface area carbon black; and about between 0 and 20 PHR of a hydrated amorphous silica.

5. A tire according to Claim 1, wherein said tread has six layers, said inner layer having between about 95 and 100 PHR of natural cis 1,4 polyisoprene; between about 5 and 0 PHR of synthetic rubber; between about 20 and 40 PHR of a low surface area carbon black; and between about 0 and 15 PHR of a hydrated amorphous silica; and

said outer layer having between about 0 and 5 PHR of natural cis 1,4 polyisoprene; between about 100 and 95 PHR of synthetic rubber; between about 50 and 70 PHR of a high surface area carbon black; and between about 0 and 30 PHR of a hydrated amorphous silica;

the second innermost layer having between about 80 and 95 PHR of natural cis 1,4 polyisoprene; between about 20 and 5 PHR of synthetic rubber; between about 25 and 45 PHR of a low surface area carbon black; and between about 0 and 15 PHR of a hydrated amorphous silica;

the third innermost layer having between about 60 and 80 PHR of natural cis 1,4 polyisoprene; between about 40 and 20 PHR of synthetic rubber; and between about 30 and 50 PHR of an intermediate surface area carbon black; and between about 0 and 20 PHR of a hydrated amorphous silica;

the fourth innermost layer having between about 40 and 60 PHR of natural cis 1,4 polyisoprene;

between about 60 and 40 PHR of synthetic rubber; between about 35 and 55 PHR of an intermediate surface area carbon black; and between about 0 and 20 PHR of a hydrated amorphous silica; and

the fifth innermost layer having between about 5 and 40 PHR of natural cis 1,4 polyisoprene; between about 95 and 60 PHR of synthetic rubber; between about 45 and 65 PHR of a high surface area carbon black; and between about 0 and 30 PHR of a hydrated amorphous silica; and

wherein said tread layers are each about 1 - 1/2 inches thick and wherein said tire is an earth moving tire.

6. A process for making a tire having at least an inner tread composition and at least an outer tread layer composition, characterizing the steps of:

compounding said layer compositions;

calendering said layers to a sheet;

wrapping said layers on a tire carcass;

wherein said inner layer has good heat resistant properties and said outer layer has good wear, cut and tear resistant properties;

wherein said tread layers contain one or more ingredients selected from the group consisting of natural cis 1,4 polyisoprene, carbon black, synethetic rubber, and hydrated amorphous silica; and

wherein said tread has between 2 and about 10 layers.

7. A process according to Claim 6, wherein said tire has 3 layers, said inner layer having between about 70 and 100 PHR of a natural cis 1,4 polyisoprene; about between 30 and 0 PHR of synthetic rubber; between about 10 and 50 PHR of a low surface

area carbon black; said outer layer having about between 0 and 30 PHR of a natural cis 1,4 polyisoprene; about between 70 and 100 PHR of a synthetic rubber; about between 40 and 80 PHR of a high surface area carbon black; and about between 0 and 30 PHR of a hydrated amorphours silica; and

wherein said tread has an intermediate layer having from about 30 and 75 PHR of a natural cis 1,4 polyisoprene; about between 70 and 25 PHR of synthetic rubber; about between 25 and 65 PHR of an intermediate surface area carbon black; and about between 0 and 20 PHR of a hydrated amorphous silica.

8. A process according to Claim 6, wherein said tread has six layers, said inner layer having between about 95 and 100 PHR of a natural cis 1, 4 polyisoprene; between about 5 and 0 PHR of synthetic rubber; between about 20 and 40 PHR of a low surface area carbon black; and between about 0 and 15 PHR of a hydrated amorphous silica;

said outer layer has between about 0 and 5 PHR of natural cis 1,4 polyisoprene; between about 100 and 95 PHR of synthetic rubber; between about 50 and 70 PHR of a high surface area carbon black; and between about 0 and 30 PHR of a hydrated amorphous silica.

9. A process according to Claim 8, wherein the second innermost layer has between about 80 and 95 PHR of natural cis 1,4 polyisoprene; between about 20 and 5 PHR of synthetic rubber; between about 25 and 45 PHR of a low surface area carbon black; and between about 0 and 15 PHR of a hydrated amorphous silica;

wherein the third innermost layer has between about 60 and 80 PHR of natural cis 1,4 polyisoprene; between about 40 and 20 PHR of synthetic rubber;

between about 30 and 50 PHR of an intermediate surface area carbon black; and between about 0 and 20 PHR of a hydrated amorphous silica;

wherein said fourth innermost layer has between about 40 and 60 PHR of natural cis 1,4 polyisoprene; between about 60 and 40 PHR of synthetic rubber; between about 35 and 55 PHR of an intermediate surface area carbon black; and between about 0 and 20 PHR of a hydrated amorphous silica;

wherein the fifth innermost layer has between about 5 and 40 PHR of natural cis 1,4 polyisoprene; between about 95 and 60 PHR of synthetic rubber; between about 45 and 65 PHR of a high surface area carbon black; and between about 0 and 30 PHR of a hydrated amorphous silica.

10. A process according to Claim 9, including milling said layer composition, and cold feed extruding said layer composition before calendering said layer into a sheet;

wherein said tread layers are each about 1 - 1/2 inches thick and said tire is an earth moving tire.

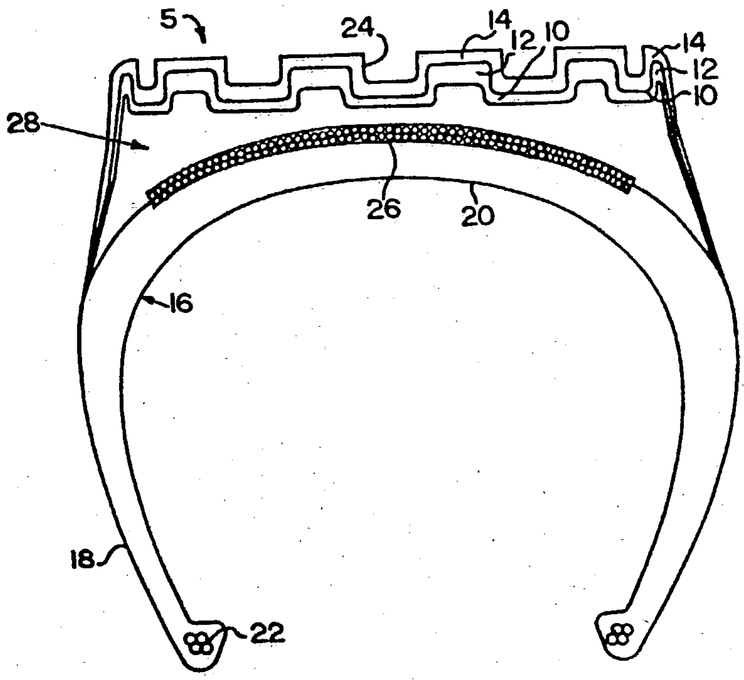

FIG.1

FIG. 2